

(5.4) Quadratic Models Using Vertex Form

- To determine the equation in vertex form $y = a(x - h)^2 + k$
 - Solve for a specific 'a' value based on the vertex and a given point

1. Find the equation of the quadratic relation, in vertex form:

a) with vertex $(-7, 2)$ and a-value of -3 .

b) with vertex $(6, -1)$ and through the point $(9, 2)$.

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1. Find the equation of the quadratic relation, in vertex form:

a) with vertex $(-7, 2)$ and a-value of -3 .

$$y = a(x - h)^2 + k$$

$$y = -3(x - (-7))^2 + 2$$

$$y = -3(x + 7)^2 + 2$$

b) with vertex $(6, -1)$ and through the point $(9, 2)$.

$$y = a(x - h)^2 + k$$

$$2 = a(9 - 6)^2 - 1$$

$$2 = a(3)^2 - 1$$

$$2 = 9a - 1$$

$$2 + 1 = 9a$$

$$3 = 9a$$

$$\frac{3}{9} = \frac{9a}{9}$$

$$\frac{1}{3} = a$$

$$y = \frac{1}{3}(x - 6)^2 - 1$$

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Example 3: Determine the equation of the parabola defined by the following table of values.

x	y
3	37
7	13
11	5
15	13
19	37

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x	y
3	37
7	13
11	5
15	13
19	37

$(11, 5)$ $(7, 13)$
 h k x y

$$y = a(x - h)^2 + k$$

$$13 = a(7 - 11)^2 + 5$$

$$13 = a(-4)^2 + 5$$

$$13 = a(16) + 5$$

$$13 - 5 = 16a$$

$$8 = 16a$$

$$\frac{8}{16} = \frac{16a}{16}$$

$$\frac{1}{2} = a$$

$$y = \frac{1}{2}(x - 11)^2 + 5$$

Symmetry
 Roots

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Example 4: The table to the right shows the height of a cannonball, h , in metres and the horizontal distance it travels, x , in metres.

a) Create a scatter plot and draw a quadratic curve of best fit.

b) Determine an equation, in vertex form, to model this relation.

c) Use your equation to predict the height of the cannonball after it has travelled 10m.

horiz dist, x	height, h
0	0
7	23
18	47
24	56
33	46
44	19
50	0

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Example 4: The table to the right shows the height of a cannonball, h , in metres and the horizontal distance it travels, x , in metres.

a) Create a scatter plot and draw a quadratic curve of best fit.

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horiz dist, x	height, h
0	0
7	23
18	47
24	56
33	46
44	19
50	0

$y = a(x - s)(x - r)$
 0 50

$(5, 20)$ x y

horizontal distance (m)

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Homework

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